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2. Preface

The Phyaction V is a Uniphy "low noise" vacuum unit with following characteristics :

- Vacuum unit with 2 independent channels.
- 2 or 4 poles
- Electronic vacuum control
- Continuous and pulse mode

The Phyaction V unit can be connected to the following Gymna electrotherapy units :

- Phyaction C
- Phyaction E
- Phyaction I

As a member of the Uniphy family it is built according to the requirements of the MDD security standards. All functions of the unit are controlled by a microprocessor, ensuring a high degree of reliability and safety.

This service manual gives a complete and accurate technical picture of the Phyaction V.
In doing so, it will hopefully help you to reach your goal: to form a correct diagnosis and to solve the client's problem as thoroughly as possible.

If you have any questions or if you need additional information about this manual or about the use of the unit, please do not hesitate to contact us.

3. Important remarks

3.1 Safety aspects

To understand and practice all procedures described in this manual a good technical background is a must.

GymnaUniphy cannot be held responsible for any actions executed on the unit by unauthorised persons, or for executing any procedures not prescribed in this manual.

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3.2 Data registration

The distributor must be able to provide the following data for each unit:

Instrument data: Part and serial number.
Gymna has the original configuration of each unit.

The **Phyaction V** has following critical parts:

- Ref 324597 : Main PCB Phyaction V
- Ref 138103 : Pump Vaco 200
- Ref 324826 : Power supply SMPS Vaco 200

All these parts have a serial-or batchnumber that has to be filed in case of a configuration change :

- Customer data: Name, full address and date of delivery.

- Service activities: All service activities must be filed.
  If any critical parts are changed, we also expect the distributor to file the new serial numbers of these part(s).

To file this data, a data registration document is available on next page.

Data registration document

Information

Distributor name	Distributor address

Customer name	Customer address

Instrument name:	Serial number:
Date of delivery:	

Service activities

Date:		
Error complaint:		
Service action		
Critical spare parts exchange list		
Critical part name	**Old serial number**	**New serial number**

Date:		
Error complaint:		
Service action		
Critical spare parts exchange list		
Critical part name	**Old serial number**	**New serial number**

4. Technical data

This is a summary of the technical data as described in the user manual.

4.1 General technical data

Dimensions Phyaciton V (w x h x d)	267 x 95 x 270 mm
Weight Phyaciton V	3,5 kg
Weight including accessories	4,6 kg
Mains voltage	100 - 240 VAC, 50 - 60 Hz
Maximum power consumption	30 VA
Safety class	Class I (earthed socket required)
Insulation	Type BF (floating patient circuit)
Fuses	2 x T2AL250V
Volume water reservoir	± 180 ml
Working pressure continuous vacuum	38 - 320 hPa
Working pressure pulsation vacuum	58 - 480 hPa
Vacuum rhythm	1,5/1,5 - 1,5/4,5 s (on/off time)

4.2 Environmental conditions

Temperature:	+10 °C to +40 °C
Relative humidity	30% to 75%
Atmospheric pressure	700 hPa to 1060 hPa

4.3 Transport and storage

Transport weight	6,5 kg
Storage temperature	-20 °C to +60 °C
Relative humidity	10% to 100%, including condensation
Atmospheric pressure	200 hPa to 1060 hPa
Transport classification	Single piece by mail

5. Circuit description

5.1 Power supply

The device is mains powered. It sports an all-range off-line switched mode power supply , meaning it can be used all over the world without having to select a working voltage or frequency. But of course the the plug of the power cord has to fit into the local outlet type.

5.2 Patient Current Routing

The electrotherapy outputs of the main unit are connected to the vacuum unit, at the rear, and the electrodes are connected to the front of the vauum unit. As long as the vacuum is not used the traditional electrodes function as before, even when the vacuum unit is not switched on. As soon as the vacuum is turned on the patient current is switched from the traditional electrodes to the connectors for the hoses at the other end of which the suction cups are. In the hoses is a wire that feeds the patient current to a metal plate inside the cup. Contact with the the skin of the patient is established by a moisturized sponge. The switchover always happens for channel A but the operator can add channel B by pressing a button that toggles the choice between traditional and vacuum electrodes.

5.3 Vacuum

When the vacuum control is turned up, air is pumped out to create the vacuum until the set level is reached. The hose connectors limit the air flow into each hose so one can put the vacuum electrodes one at a time in their place. When channel B is not used, its connectors should be plugged by connecting them to each other by a hose, otherwise the pump keeps running and deeper vacuum levels cannot be reached.

5.3.1 Control Loop

A pressure sensor measures the vacuum level and a control loop powers the pump if the set level is deeper or opens a valve to let air in when lower . In continuous mode this results in only the pump being run very lightly, making up up for the small air leakage between the cups and the skin and at the connectors.

5.3.2 Pulsed Vacuum

When the electrodes are in place the operator can pulsate the vacuum to mitigate the effect vacuum has on patients with a vulnerable skin. When pulsating, the vacuum is raised by 50% during 1.5 second and then returns for 1.5 to 4.5 seconds to the level set for continuous operation. As a result the pump will run during the 1.5 second period of deepened vacuum after which the valve will be opened until the base level is reached again.

5.3.3 End of Treatment

Prolonged exposure to the vacuum under the suction cups can lead to injuries, e.g. when the patient is forgotten by the operator (actually has happened!). To prevent this, the unit senses the patient current in both channels when the vacuum is turned up. To keep the patient circuits floating this is done by optocouplers blocking a timer from running while the vacuum is switched on. As soon as no current is flowing in both channels, this timer will start running and, on timing out after a couple of minutes, switch off the vacuum. The yellow output indicator light(s) next to the vacuum connectors will now flash until the vacuum control knob is turned back to zero.

5.3.4 Water management

Because the sponges in the vacuum cups must be moistened for conductivity, unavoidably droplets are sucked into the system. These droplets do not only contain water but also fibers from the sponges, flakes of skin and other substances present under the cups. To prevent these to reach the pump and pollute it, the air crosses a water container first where the not gaseous particles are percipitating. The now clean air is prcocessed by the pump and released into the ambient through a silencer. After a while this container will get filled with water and if not emptied, water would reach the pump and be sprayed out through the silencer. To prevent this happening there is a level detector inside the water container. When too high a level is detected, this is shown to the operator by a blinking light next to the ‘water container full’ symbol on the front. A running session will not be ended by this situation but when trying to turn up the vacuum from zero for a new treatment, nothing will happen. The operator first has to empty the water conainer by detaching the hose at the rear side of the unit and letting out the water.

6. Safety inspection list (yearly check-up)

Customer identity

Unit:
Serial number:
Date:

Test 1: General inspection

	Pass	Fail	N.A.
Results of previous safety inspections are available			
The user manual is present			
The device label and suppliers label are clearly readable			
The enclosure, the intensity controls, the keys and the display are undamaged			
Mains entry and power cord are undamaged			
The output connectors are undamaged			
The electrode connectors and cables are undamaged.			
All the operation functions work			
The measured output signals are correct			
All the alarm functions work.			

Remarks:

Test 2: electrical safety test according to VDE 0751

Parameter	Measured	Limit	Comments	Pass	Fail
Protective earth resistance	Ω	< 0.2 Ω			
Enclosure leakage current	µA	< 1000 µA			
Patient leakage current	µA	< 5000 µA			

The unit ……. With serial number …… has passed/failed the test

Name service engineer Signature

7. Hardware labels.

Each PCB (except the display PCB and the power supply) has a label with the hardware code which GymnaUniphy sticks on the PCB during production.
The main PCB consists of an eeprom in which the actual hardware code of the used PCB is saved.

The hardware code consists of 4 characters and is composed as follows (from left to right):

0…	From 1 to 9.	Increase in case of a principle technology change.	Hardware is not compatible anymore. All previous changes made in hardware shall be inherited in the new layout. The last 3 alphanumerical numbers will begin with A
.A..	A to Z	Increase in case of a principle technology change.	Components are not anymore compatible with the previous layout. All previous changes made in hardware shall be inherited in the new layout. The last 2 alphanumerical numbers will begin with A
..A.	A to Z	Increase in case of component change.	
…A	A to Z	Increase in case of a PCB track change.	

Example:

Suppose that resistor R68 changes from 22 K to 100 K.
The actual hardware version 1AAA will be upgraded to 1ABA.

7.1 Upgrading the hardware code.

Every hard-or software change will be presented in a technical bulletin. In case of a hardware change GymnaUniphy will provide the necessary components as well as a new hardware label. This label must be put on the upgraded PCB.

8. Replacement procedures

The most frequent service operations will be exchanging defective boards rather than repairing them.

When handling static sensitive devices such as PC boards of the Phyaciton V, the following precautions should be observed:

- Persons should be earthed by means of a wrist strap.
- Ground all electrical equipment, work bench, soldering iron…

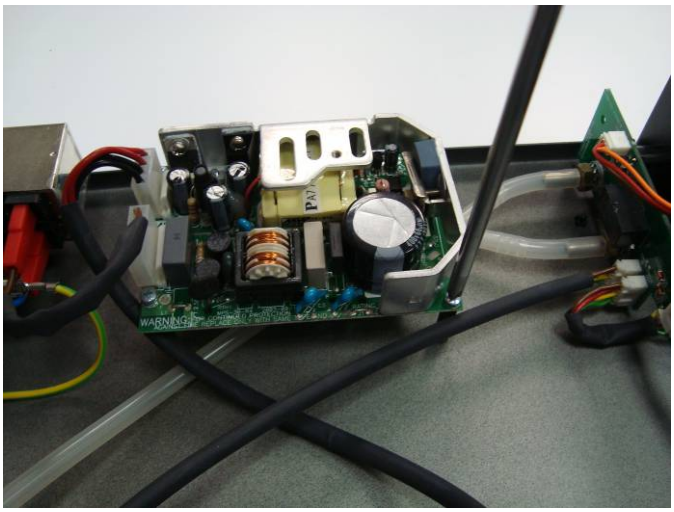
This chapter will explain how to open the unit and remove the PCB's for exchange.

8.1 Opening the unit

Step 1 : Remove the 2 bolt at the back of the unit

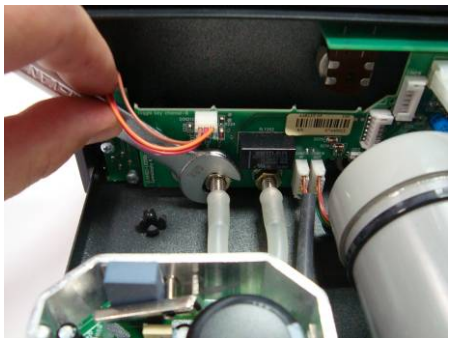
Step 2 : Take of the cover.

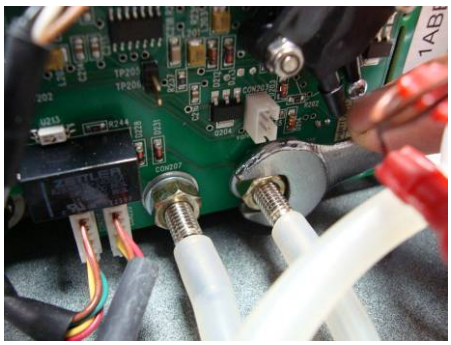
8.2 Replacement of power supply PCB



Unscrew the 4 screws of the power supply PCB and replace with a new PCB

8.3 Replacement of the Main PCB





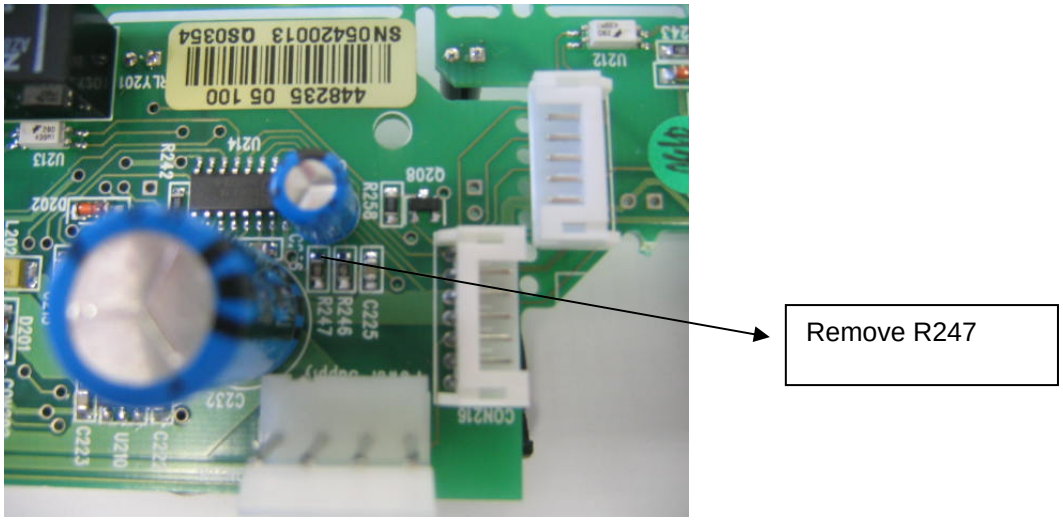
The main PCB is one board in production that is divided over the front of the unit.
To remove on of these boards it is necessary to loosen the bolts of the metal vacuum outlets.

9. Upgrades

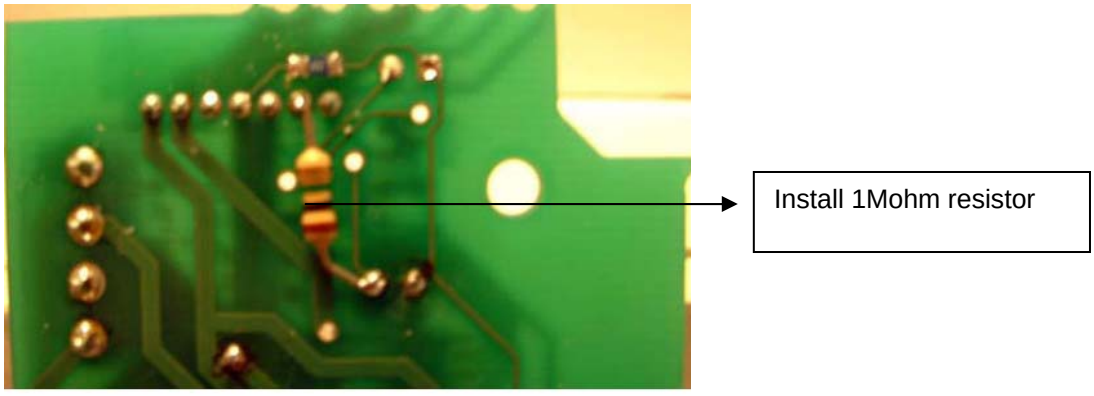
9.1 Vacuum pump switches of after 2 minutes even when current is flowing

The Phyaction V has an automatic current sense circuit. If the unit doesn't detect any current for more than 120 sec, the vacuum is switched off and the vacuum cups will be released from the patient.
We have noticed that is some cases, the vacuum is switched off, even when there is current detected. In order to solve this, the unit needs to be modified.

Step 1: open the unit
Step 2: remove the main PCB from the unit
Step 3: remove R247 from the main PCB (photo below). Be careful about the 2 adjacent capacitors.



Step 4: install a 1Mohm resistor between C233p+ and CON216p7 (photo below).



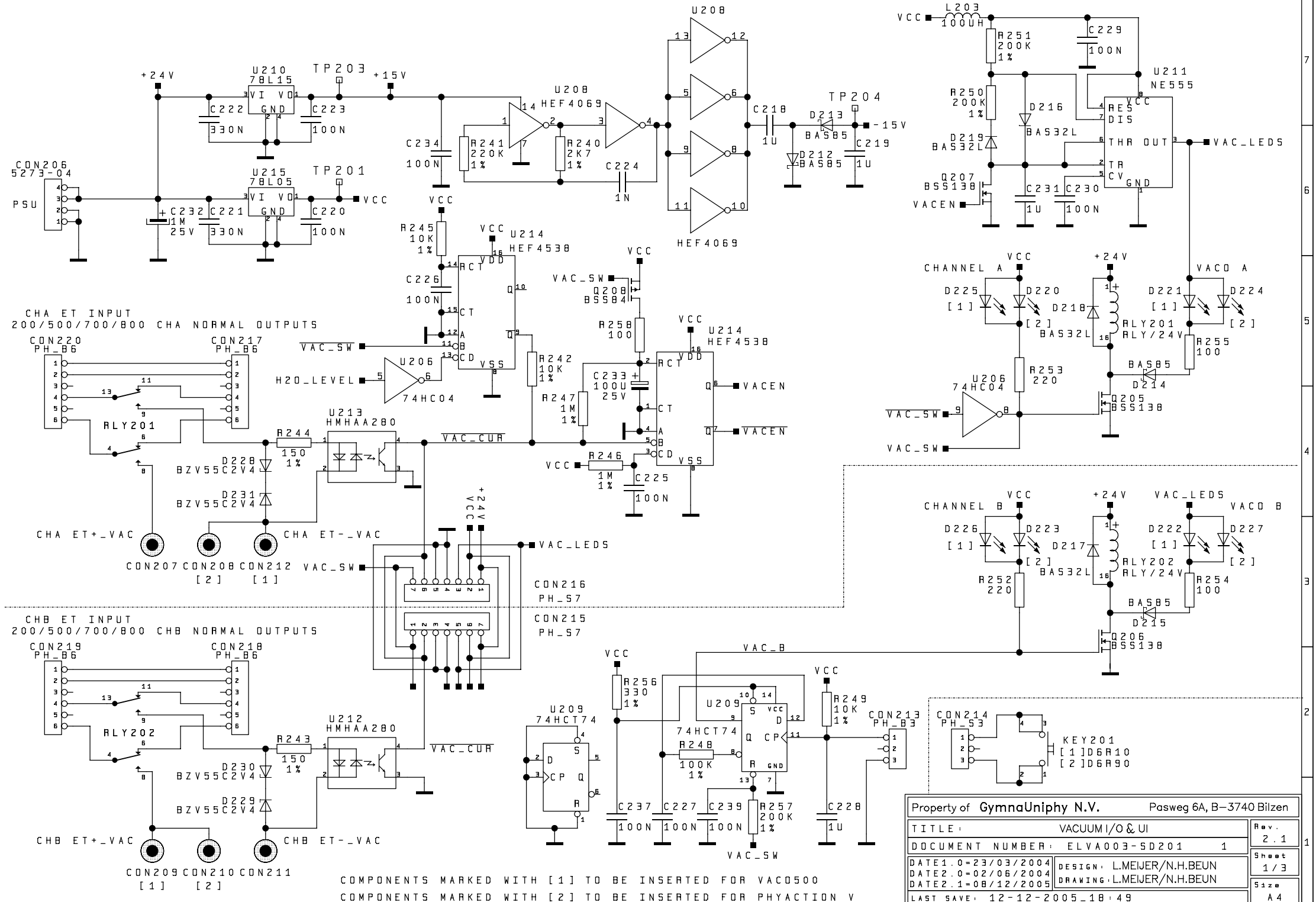
Step 5: change the hardware code into 1AAB
Step 6: close the unit and perform a functional and safety test

10. Spare parts list

138103	PUMP, PM16170-86, G/PHY.V/VACO.500
324597	MAIN PCB., PHYACTION V / VACO 200
324650	CABLE ASSY ET-IN, VACO500/PHYACTION V
324727	CABLE ASSY MAINS INLET, SMPS, 200-SERIES
324793	BOTTOM BOX PHYACTION V
324804	METAL TOP COVER PHYACTION V
324837	CABLE ASSY MAINS INLET, SMPS, 200-SERIES
352578	VACO OUTLET CONNECTOR, PHYACTION V

11. Schematics and PCB layout

See next pages


CON206
5273-04
PSU
+24V
U210
78L15
VI VO
GND
C222
330N
C223
100N
TP203
+15V
U215
78L05
C232
1M
25V
C221
330N
C220
100N
TP201
VCC
U208
HEF4069
C234
100N
R241
220K
1%
R240
2K7
1%
C224
1N
C218
1U
D213
BAS85
TP204
-15V
D212
BAS85
C219
1U
L203
100UH
R251
200K
1%
C229
100N
U211
NE555
R250
200K
1%
D216
BAS32L
D219
BAS32L
RES
DIS
THR
TR
CV
OUT
GND
VAC_LEDS
Q207
BSS138
VACEN
C231
1U
C230
100N
R245
10K
1%
U214
HEF4538
VDD
RCT
CT
A
B
C
D
VSS
Q
C226
100N
VAC_SW
Q208
BSS84
R258
100
R242
10K
1%
U206
74HC04
H2O_LEVEL
C233
100U
25V
R247
1M
1%
R246
1M
1%
C225
100N
CHANNEL A
D225
[1]
D220
[2]
D218
BAS32L
RLY201
RLY/24V
D221
[1]
D224
[2]
VACO A
R255
100
R253
220
BAS85
D214
Q205
BSS138
CHA ET INPUT
200/500/700/800 CHA NORMAL OUTPUTS
CON220
PH_B6
CON217
PH_B6
RLY201
R244
150
1%
U213
HMHAA280
VAC_CUR
D228
BZV55C2V4
D231
BZV55C2V4
CHA ET+_VAC
CHA ET-_VAC
CON207
[2]
CON208
CON212
[1]
+24V
VCC
CON216
PH_S7
CON215
PH_S7
CHANNEL B
D226
[1]
D223
[2]
D217
BAS32L
RLY202
RLY/24V
D222
[1]
D227
[2]
VACO B
R252
220
R254
100
BAS85
D215
Q206
BSS138
CHB ET INPUT
200/500/700/800 CHB NORMAL OUTPUTS
CON219
PH_B6
CON218
PH_B6
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R243
150
1%
U212
HMHAA280
VAC_CUR
D230
BZV55C2V4
D229
BZV55C2V4
CHB ET+_VAC
CHB ET-_VAC
CON209
[1]
CON210
CON211
[2]
U209
74HCT74
R256
330
1%
R248
100K
1%
R249
10K
1%
CON213
PH_B3
CON214
PH_S3
KEY201
[1]D6R10
[2]D6R90
C237
100N
C227
100N
C239
100N
R257
200K
1%
C228
1U
VAC_B
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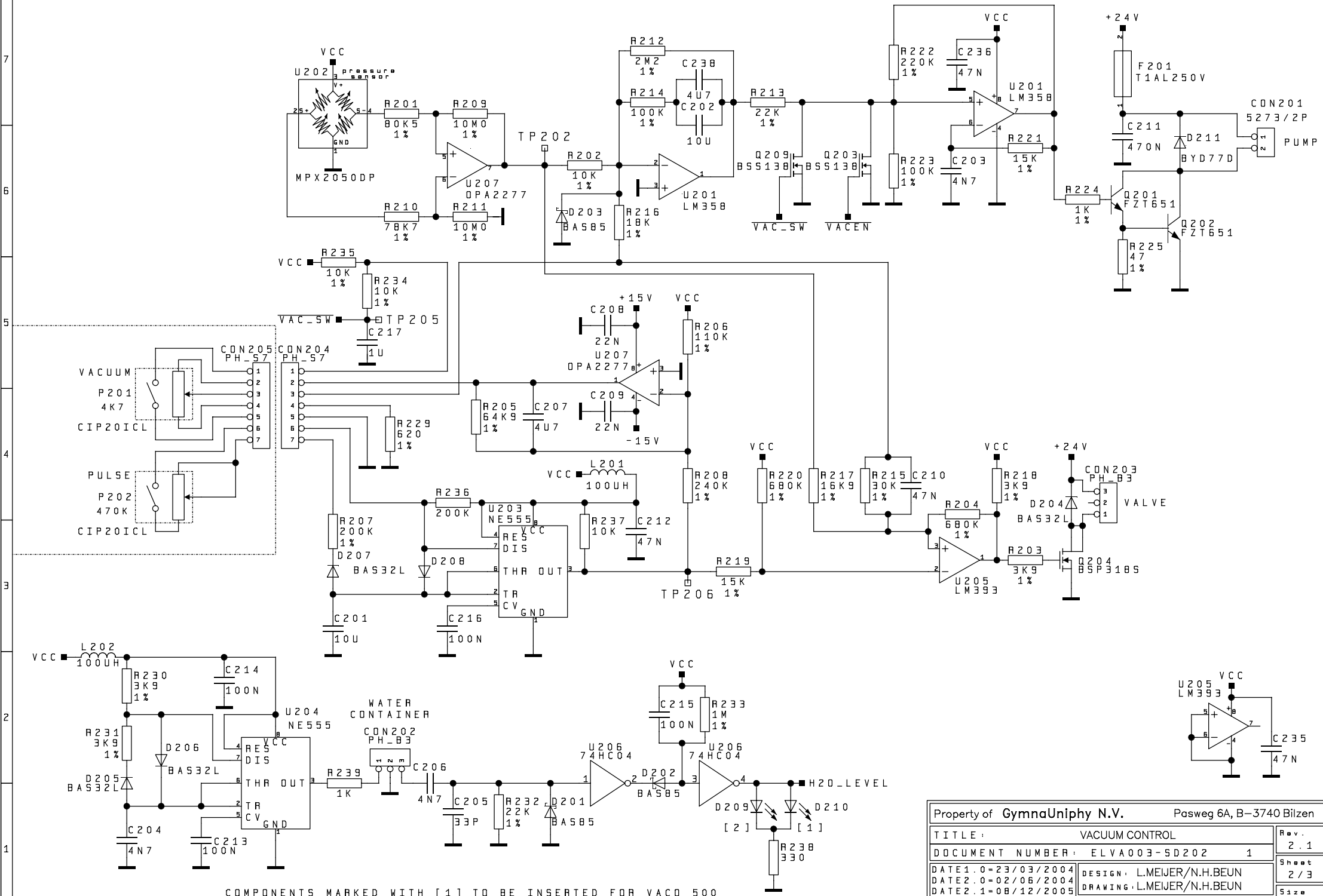

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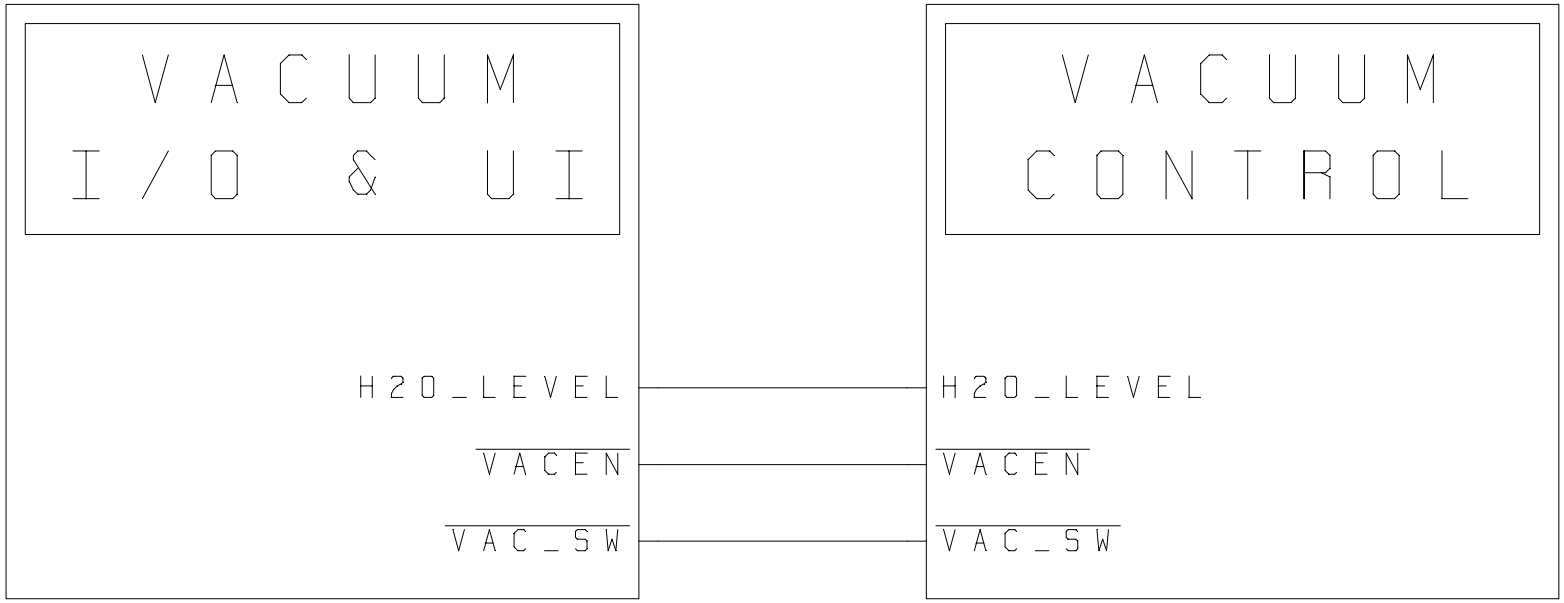

Signature for agreement			
	Name	*Signature*	*Date*
Review Moderator			
R&D Manager			

Property of GymnaUniphy N.V. Pasweg 6A, B–3740 Bilzen

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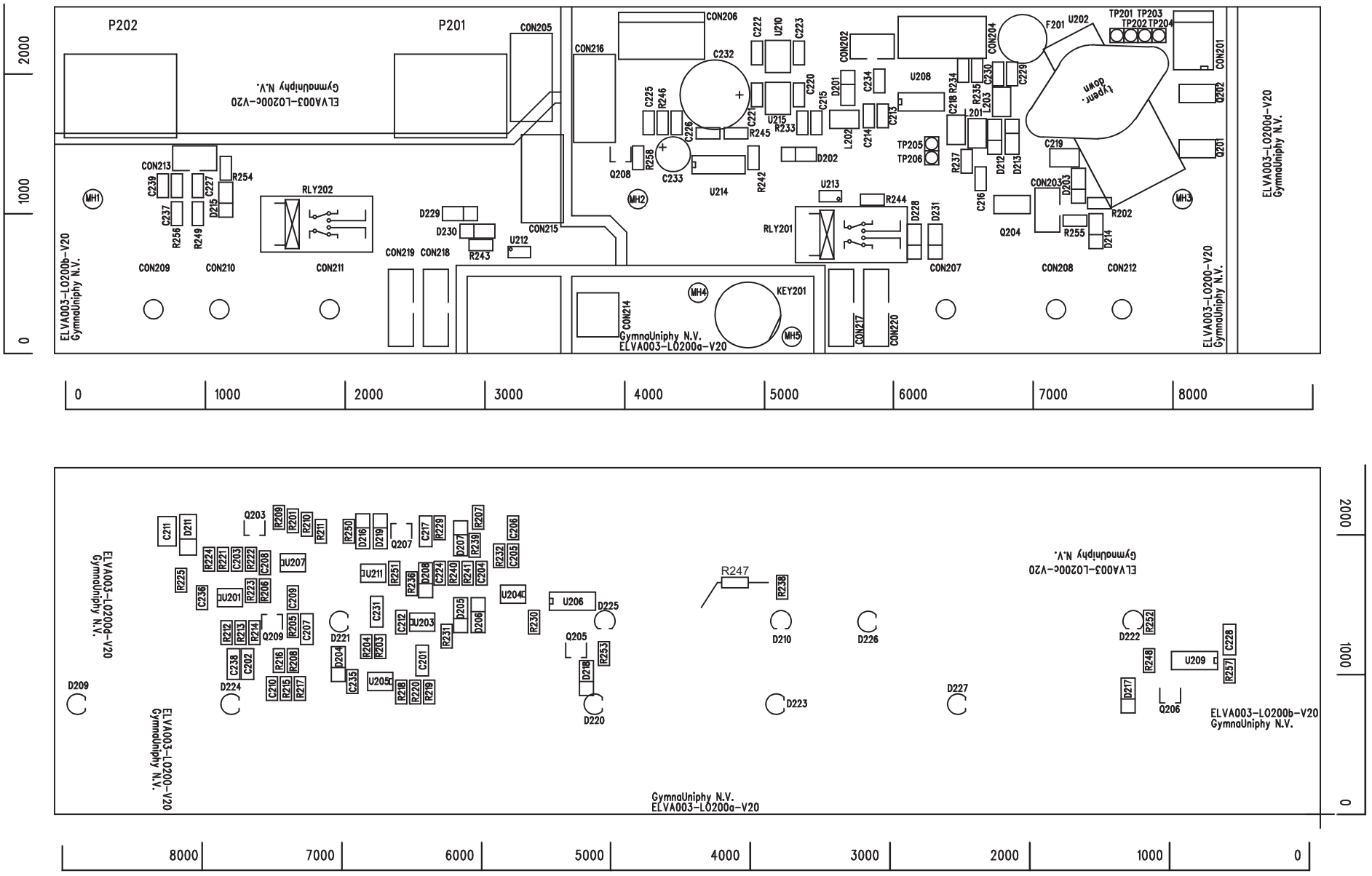

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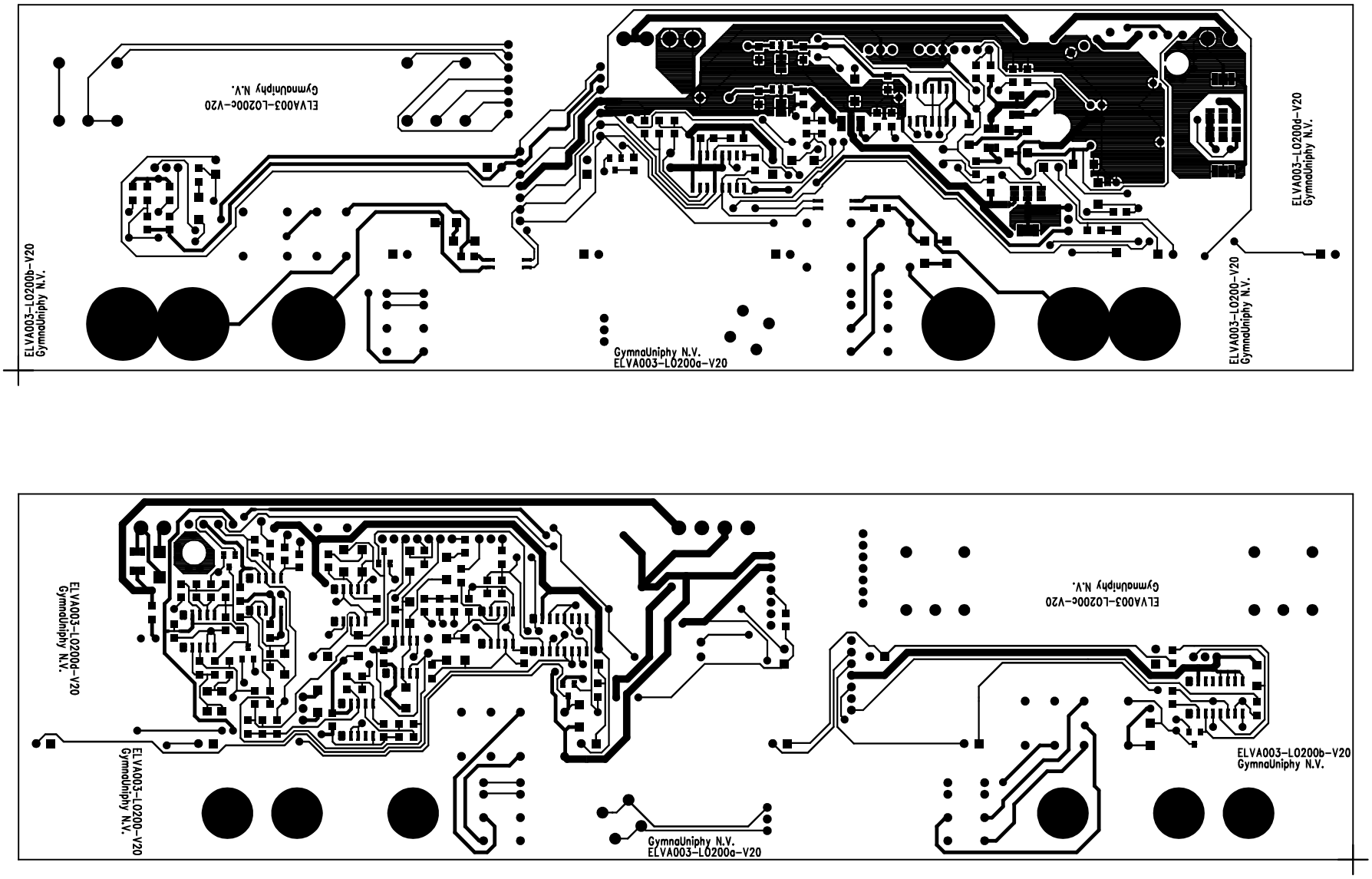
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ELVA003-LO200c-V20
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